

COMBINED QUARTERLY REPORTS

for periods ending 15 January 1965 and 15 April 1965

HELIOS DESIGN STUDIES

(NASA Contract R-107)

(SC: R-107/09-29-003)

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#### 1. Diffraction gratings

The contract Nonr-4277(00)(X) with Bausch and Lomb, Incorporated (B&L) for the study of diffraction gratings has terminated and a second contract has been let to continue the study. A fourth quarterly report and the final report have been received and are being submitted as enclosures (2) and (3).

#### 2. Filters

Unbacked films of Si have been made and their transmittances measured. They begin to transmit at about  $700 \text{ \AA}$  and reach peak transmittance just at the  $L_{2,3}$  edge  $126 \text{ \AA}$  where a film  $1250 \text{ \AA}$  thick transmits approximately 70%. The transmittance then drops sharply due to absorption of radiation by L electrons. Measurements can only be made to wavelengths as short as  $120 \text{ \AA}$ , however, spectra of a vacuum spark obtained using a Si filter show that Si transmits at  $50 \text{ \AA}$ . Because of the paucity of emission lines at these wavelengths, the extent of this window could not be determined.

The usefulness of Si as a filter to transmit extreme ultraviolet (XUV) radiation and reject near ultraviolet and visible may be limited by two factors. First, it is very brittle and consequently difficult to handle. Second, Si films

do transmit in the infrared and, to a lesser extent, at the red end of the visible spectrum.

### 3. Polarizers

A pile-of-plates transmitting polarizer and analyzer that uses LiF plates has been obtained from Harshaw Chemical Company and a suitable mounting is presently being constructed. Its first use will be to study the polarization of the radiation emerging from a normal incidence XUV monochromator. This investigation will help to establish the limitations of the polarizer. Once these are known, a study of the influence of polarization on the photoelectric effect will be undertaken.

### 4. Detectors

The study of the photon counting properties of various detectors is being continued.

### 5. Method for measuring optical constants

A study of the reflectance method of measuring optical constants has been completed and is being submitted to the Journal of the Optical Society of America for publication. Copies are submitted as enclosure (4).

### 6. White Light Coronagraph

(1) A photoelectric coronagraph with a serrated-edge occulting disk, developed partly under Contract R-107 funds, was launched successfully in orbiting solar observatory OSO-B2 in February 1965. The instrument appears to be operating properly in orbit, and data are being collected and reduced.

(2) Two photographic coronagraphs, arranged side-by-side, and bearing smooth-edge triple-occulting disks developed under Contract R-107 (Helios).

but constructed under Fund Transfer R-09-029-036 are being readied for launching. The flight is scheduled on May 30, 1965, from the White Sands Missile Range (WSMR) during the time of an eclipse which occurs to the south of WSMR. Exposures will be made when the moon is silhouetted against the corona, with one edge of the moon being illuminated with grazing sunlight. The experiment is designed to give information on the moon's surface, on the dust particle content of the space between moon and earth, and on the polarization and intensity of the solar corona.

(3) In the planning stage are modifications and additions to the present coronagraph testing facility which consists of a vacuum tank 20 feet long and 3 feet in diameter, with a carbon arc solar simulator. Modifications are in the direction of light beams of larger cross section, plus greater tank length to accommodate large coronagraphs with long booms.